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(b) Let $(-9-4\sqrt{3}+4\sqrt{2}+2\sqrt{6})^{\frac{1}{2}}=\sqrt{(-m+n)}$.

$\sqrt{[(-m+n)(-m-n)]}=\sqrt{[(-m)^2-n^2]}=\sqrt{[73+40\sqrt{3}]}=\sqrt{[p+q]}$.

$\sqrt{[(p+q)(p-q)]}=23$.

Let $\sqrt{(p+q)}=\sqrt{(x+23)}+\sqrt{x}$. Then $2x+23=73$, or $x=25$.

$\therefore \sqrt{(p+q)}=4\sqrt{3}+5$.

Let $\sqrt{(n-m)}=-\sqrt{(x+4\sqrt{3}+5)}+\sqrt{x}$. Then $2x+4\sqrt{3}+5=-9-4\sqrt{3}$, or $x=-7-4\sqrt{3})$.

$\therefore \sqrt{(n-m)}=\sqrt{(-7-4\sqrt{3})}-\sqrt{-2}$.

$\sqrt{[(-7-4\sqrt{3})(-7+4\sqrt{3})]}=1$.

Let $\sqrt{(-7-4\sqrt{3})}=\sqrt{(x+1)}+\sqrt{x}$; then $2x+1=-7$, $x=-4$.

$\therefore \sqrt{(-7-4\sqrt{3})}=\sqrt{(-3)}+2\sqrt{(-1)}$.

$\therefore \sqrt{(n-m)}=\sqrt{(-3)}+2\sqrt{(-1)}-\sqrt{(-2)}$.

Also solved by G. I. Hopkins and A. H. Holmes.

332. Proposed by **C. N. SCHMALL, New York City.**

Solve the quadratic, $x^2+ax+b=0$, without completing the square.

Solution by **ARTEMAS MARTIN, LL. D., Washington, D. C.**

Assume $y-\frac{1}{2}a=x$, and substitute in the given quadratic and it becomes

$$(y-\tfrac{1}{2}a)^2+a(y-\tfrac{1}{2}a)+b=0, \text{ or } y^2-\tfrac{1}{4}a^2+b=0;$$

whence $y=\pm\sqrt{(\frac{1}{4}a^2-b)}$ and $x=\pm\sqrt{\frac{1}{4}a^2-b)}-\frac{1}{2}a$.

See *Mathematical Magazine*, Vol. I, No. 9 (January, 1884), p. 146.

Solved similarly by V. M. Spunar , Levi S. Shively and the Proposer.

Professor Hopkins, in his solution, made use of the principle that the sum of the roots is equal to the coefficient of x with sign changed, and the product of the roots is equal to the final term.

S. Lefsehetz sent in solutions of 327 and 328 too late for credit in last issue.

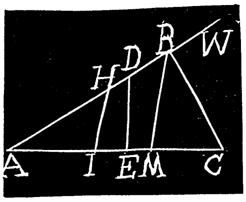
GEOMETRY.

356. Proposed by **G. I. HOPKINS, Manchester, N. H.**

Required to construct a triangle having given, base, vertical angle, and difference of other two sides.

I. Solution by **J. M. ARNOLD, Crompton, R. I.**

Let x=the longer side, then $x-d$=the shorter side. Let A=the vertical angle. Then



$$x^2-(x\cos A)^2=(x-d)^2-(b-x\cos A)^2$$

which gives

$$(2b\cos A-2d)x=b^2-d^2.$$

Dividing by 4 and putting in the form of a proportion